This is a continuation of Application No. 10/060,016 filed January 31, 2002; the disclosure of which is incorporated herein by reference.

On page 6, please delete the first full paragraph and replace it with the following new paragraph:

In another method of manufacturing the image carrier of the present invention, a liquid, prepared by dispensing conductive particles dispersed into the predetermined liquid, is displayed onto predetermined positions of the outer surface of an image carrier made of an insulating material which is soluble relative to the predetermined liquid, thereby forming the conductive portions. Also according to this method, the large number of conductive portions separately dispersed can be easily formed. Therefore, the image carrier can be easily manufactured.

On page 10, please delete the second full paragraph and replace it with the following new paragraph:

Figs. 28 (A) and 28 (B) show another example of the image forming apparatus of the present invention, wherein Fig. 28(A) is a schematic illustration showing the function of a charge injection layer through application or removal of charge of the writing electrodes of the writing device, Fig(B) is a graph showing the relation between the voltage applied to electrodes and the surface potential of the charge injection layer;;

On page 10, please delete the third full paragraph and replace it with the following new paragraph:

Fig. 29 is a schematic illustration for explaining a problem of the embodiment shown in Figs. 28 (A) and 28(B);

On page 11, please delete the third full paragraph and replace it with the following new paragraph:

As shown in Fig. 2, the image carrier 2 is formed in a drum shape having a multi-layer structure comprising a conductive substrate 2a which is mage of a conductive material such as aluminium, positioned near the axis of the image carrier 2, and grounded, a dielectric layer 2b formed on the outer surface of the conductive substrate 2a, and a charge injection layer 2c having a large number of conductive portions formed on the outer surface of the dielectric layer 2b. It should be noted that the image carrier 2 may be formed in a belt shape.

Please delete the paragraph bridging pages 11 and 12 and replace it with the following new paragraph:

As shown in Figs. 3(a) and 3(b), the large number of conductive portions $2c_1$ are formed just like islands (hereinafter, sometimes called as "islands-in-sea structure") on the outer surface of the dielectric layer 2b in such a manner that these conductive portions $2c_1$ are electrically separated from, independent of each other, and dispersed from each other. That is, a number of indented concavities $2b_1$ are formed to be dispersed separately from each other in the outer

surface of the dielectric layer 2b and a conductive material $2c_1$ (shown in Figs. 4(a)-4(g) as will be described later) such as a conductive resin or a conductive filler is filled in the indented concavities $2b_1$, thereby forming the conductive portions $2c_1$ just like islands in the sea, on the outer surface of the dielectric layer 2b, the conductive portions $2c_1$ being composed of local conductive portions dispersed separately from each other.

On page 12, please delete the first full paragraph and replace it with the following new paragraph:

Parts of the large number of conductive portions $2c_1$ may be exposed on the surface of the dielectric layer 2b and the other parts may be embedded in the surface of the dielectric layer 2b. That is, the conductive portions $2c_1$ are provided in such a manner that at least parts thereof are exposed on the surface. The exposed parts of the conductive portions $2c_1$ ensure the stable application or removal of charge relative to the image carrier.

On page 13, please delete the first paragraph and replace it with the following new paragraph:

The material for the conductive portions $2c_1$ is a material of which resistance is in a range lower than the resistance of the dielectric layer 2b which is about $10^{10}\Omega$ in maximum. In this case, too large electric resistance of the conductive portions $2c_1$ leads to defect in writing of an latent image due to some delay of writing. Therefore, the electric resistance of the conductive portions $2c_1$ is preferably lower as the process speed is increased.

On page 13, please delete the second paragraph and replace it with the following new paragraph:

As the material used for the conductive portions $2c_1$, conductive resin or conductive filler can be employed. As the material used as the conductive resin and the conductive filler, a conductive high-molecular powder such as a high-molecular complex made of polyacetylene doped with iodine, a high-molecular complex made of polythiopene doped with iodine, and a high-molecular complex made of polypyrrole doped with iodine, and a combination thereof may be employed. In this case, the content of conductive particles/conductive filler is from 10 to 100 % by weight for regulating the resistance.

On page 13, please delete the third paragraph and replace it with the following new paragraph:

The charge injection between the conductive portions $2c_1$ and the writing electrodes 3b is conducted by the contact of the writing electrodes (corresponding to the charge-transfer controlling means of the present invention) 3b with the plurality of conductive portions $2c_1$. It should be understood that there are a case where charge is injected (transferred) from the writing electrodes 3b to the conductive portions $2c_1$ and a case where charge is injected (transferred) from the conductive portions $2c_1$ to the writing electrodes 3b and that the former case means that charge is applied to the image carrier and the latter case means that charge is removed from the image carrier 2.

On page 14, please delete the first paragraph and replace it with the following new paragraph:

The electric resistance of each conductive portion $2c_1$ is set to satisfy "electric resistance in vertical direction (i.e. the depth direction perpendicular to the plane direction of the conductive portion $2c_1$) < electric resistance in lateral direction (i.e. the plane direction of the conductive portion $2c_1$)". That is, the conductive portions are anisotropic, thereby making the lateral movement of charge difficult, i.e. making the leakage difficult during charge injection between the writing electrodes 3b and the conductive portion $2c_1$. Therefore, charge can be effectively transferred in the vertical direction. This ensures the application of charge and the removal of charge relative to the image carrier 2.

On page 15, please delete the first full paragraph and replace it with the following new paragraph:

Then, as shown in Fig. 4(d), a conductive material $2c_1$ such as a conductive resin or a conductive filter is coated on the surface of the dielectric layer 2b with the concavities $2b_1$. After that, as shown in Fig. 4(e), at least a surface of the coated conductive material $2c_1$ is ground such that the conductive material $2c_1$ remains in the concavities $2b_1$, thereby forming a large number of local conductive portions. In this manner, the latent carrier 2 is formed which has the dielectric layer 2b of a predetermined thickness (for example, 10-30 μm) formed on the conductive substrate 2a, and the large number of local conductive portions i.e. the conductive

portions $2c_1$ separately and dispersedly formed in the surface of the dielectric layer 2b as shown in Fig. 4(f).

On page 15, please delete the second full paragraph and replace it with the following new paragraph:

In this case, as shown in Fig. 4(g), the surface area A_1 of each conductive portion $2c_1$ is set to be smaller than the contact area A_2 of each writing electrode 3b when the writing electrode 3b is in contact with the surface of the dielectric layer 2b and also smaller than the contact area A_3 of toner supplied from the developing device 4 to the surface of the dielectric layer 2b.

Please delete the paragraph bridging pages 15 and 16 and replace it with the following new paragraph:

First, as shown in Fig. 5(a), a conductive substrate 2a of a conductive material such as Al is prepared. As shown in Fig. 5(b), a large number of concavities $2a_1$, which are suitably rough and dispersed separately from each other, are formed in the outer surface of the conductive substrate 2a by surface treatment such as blasting the surface of the conductive substrate 2a. Then, as shown in Fig. 5(c), a dielectric layer 2b is formed on the conductive substrate 2a by coating. At this point, stable surface roughness is formed in the surface of the dielectric layer 2b corresponding to the concavities $2a_1$ of the conductive substrate 2a so that the dielectric layer 2b is formed with a large number of concavities $2b_1$ which are dispersed separately from each other. After that, the same or similar processes as those shown in Figs. 4(d)-4(f) are conducted so as to

form a large number of local conductive portions, i.e. conductive portions $2c_1$, which are separately dispersed, in the respective concavities $2b_1$.

Please delete the paragraph bridging pages 16 and 17 and replace it with the following new paragraph:

In the examples shown in Figs. 4(d)-4(f) and Figs. 5(a)-5(c), though the conductive material $2c_1$ such as conductive resin and conductive filler is coated on the surface of the dielectric layer 2b, the present invention is not limited thereto so that other materials may be employed. For example, as the conductive material $2c_1$, a paint (coat) composed of a binder resin and conductive particles or conductive filler of a suitable amount to be dispersed in the binder resin may be used, so this paint is coated on the surface of the dielectric layer 2b formed with the concavities $2a_1$, and then the resultant coating layer is ground, thereby forming the latent carrier 2 is formed which has the dielectric layer 2b formed on the conductive substrate 2a, and the local conductive portions i.e. the conductive portions $2c_1$ separately and dispersedly formed in the surface of the dielectric layer 2b.

On page 17, please delete the second full paragraph and replace it with the following new paragraph:

In case of the conductive portions $2c_1$ with uniform dispersal obtained by a binder dispersant method as shown in Table 1, smaller thickness of the conductive portions $2c_1$ facilitates the achievement of anisotropy in the resistance.

On page 19, please delete the second full paragraph and replace it with the following new paragraph:

As shown in Figs. 7(a) and 7(b), the conductive portions $2c_1$ may be formed by spraying a liquid, prepared by dispersing conductive particles in the alkali liquid, onto an insulating binder layer 2d (a part of the dielectric layer 2b), as the outermost layer of the image carrier which is soluble relative to alkali, at equal intervals defined by the ink jet printing method. Besides the alkaline liquid and the insulating binder layer which is soluble relative to alkali, it should be noted that a liquid of another kind and a dielectric layer 2b made of an insulating material which is soluble relative to the liquid may be employed.

On page 19, please delete the third full paragraph and replace it with the following new paragraph:

In the aforementioned islands-in-sea structure, a large number of conductive portions $2c_1$ which are separately dispersed can be formed in the outer surface of the dielectric layer 2b in another method besides the aforementioned methods.

On page 20, please delete the first paragraph and replace it with the following new paragraph:

Charge injection between the writing electrodes 3b of the writing device 3 and the conductive portions $2c_1$ can be conducted dominantly by contacts of the writing electrodes 3b of the writing device 3 with the conductive portions $2c_1$. Though the description will be made on

the assumption that the conductive substrate 2a of the image carrier 2 is grounded, this assumption is just for facilitation of explanation. The present invention is not limited to the condition that the conductive substrate 2a of the image carrier 2 is grounded, a voltage of lower absolute value than the absolute value of the predetermined voltage V_0 to be applied for writing may be applied to the conductive substrate 2a as described later.

Please delete the paragraph bridging pages 20 and 21 and replace it with the following new paragraph:

The substrate 3a is formed in a rectangular shape having substantially the same axial length as the axial length of the conductive portions $2c_1$ of the image carrier 2. The substrate 3a is arranged to extend from the left side in Fig. 1 in the same direction as the rotational direction (the clockwise direction shown by arrow) of the image carrier 2. To the contrary, the substrate 3a may be arranged to extend from the right side in Fig. 1 in the opposite direction of the rotational direction of the image carrier 2.

Please delete the paragraph bridging pages 21 and 22 and replace it with the following new paragraph:

In the embodiment shown in Figs. 8(a), 8(b), a large number of conductive portions $2c_1$ are formed and arranged like dots separately dispersed. In the embodiment shown in Figs. 9(a) and 9(b), a large number of conductive portions $2c_1$ which are formed and arranged like dots

separately dispersed and each conductive portion $2c_1$ is composed of a predetermined number of gathered conductive particles $2c_2$.

On page 22, please delete the first full paragraph and replace it with the following new paragraph:

Such an arrangement that a large number of conductive portions $2c_1$ are formed and arranged like dots which are separately dispersed ensures stable and more precise application or removal of charge relative to the image carrier 2.

On page 22, please delete the second full paragraph and replace it with the following new paragraph:

In either of the embodiments shown in Figs. 8(a), 8(b) and Figs. 9(a), 9(b), similarly to the aforementioned embodiment, it is preferable that the large number of conductive portions $2c_1$ are formed to be at least partially exposed to the surface.

On page 22, please delete the fourth full paragraph and replace it with the following new paragraph:

As shown in Fig. 10, in the array pattern for the writing electrodes 3b, the writing electrodes 3b are each formed in circle and are aligned in the axial direction (the vertical direction in Fig. 10) of the image carrier 2. In this case, the writing electrodes 3b are arranged in two parallel rows (first and second rows) in a zigzag fashion. Though not clearly shown in Fig.

10, the electrodes are arranged such that electrodes which are in different rows but adjacent to each other are partially overlapped with each other in the direction perpendicular to the axial direction of the image carrier 2. This array pattern can eliminate such portions in the surfaces of the conductive portions $2c_1$ of the image carrier 2 that are not subjected to the application or removal of charge, thereby achieving application or removal of charge relative to the entire surfaces of the conductive portions $2c_1$ of the image carrier 2.

On page 25, please delete the first full paragraph and replace it with the following new paragraph:

According to the image forming apparatus 1 employing the electric writing device 3 having the aforementioned structure, charge is injected to the conduct portions $2c_1$ of the image carrier 2 by the writing electrodes 3b of the writing device 3 which are in contact with the image carrier 2 so that charge injection is conducted dominantly, thereby achieving the writing of an electrostatic latent image on the image carrier 2. Then, the electrostatic latent image on the image carrier 2 is developed with developing powder 8 conveyed by the developing roller 4a of the developing device 4 to form a developing powder image and the developing powder image is subsequently transferred to the receiving medium 5 by the transferring device 6.

On page 25, please delete the second full paragraph and replace it with the following new paragraph:

As mentioned above, in the image carrier 2 of this embodiment, a large number of the conductive portions $2c_1$ which are dispersed separately from each other are formed in the outer surface of the dielectric layer 2b and the application or removal of charge can be conducted dominantly by charge injection between the conductive portions and the charge-transfer controlling means. Therefore, the voltage to be applied can be significantly reduced as compared with the conventional device which applies or removes charge by discharge phenomenon.

Please delete the paragraph bridging pages 25 and 26 and replace it with the following new paragraph:

Since a large number of the conductive portions $2c_1$ are dispersed separately from each other, charge applied to the conductive portion can be prevented from leaking in the lateral direction and charge on charged conductive portions $2c_1$ can be prevented from leaking i.e. from moving to another conductive portion 2c. Therefore, stable application or removal of charge relative to the image carrier can be conducted by charge injection.

On page 26, please delete the first full paragraph and replace it with the following new paragraph:

Further, since the surface area of each conductive portion $2c_1$ is set to be smaller than the contact area of each writing electrode 3b and also smaller than the contact area of toner, stable application or removal of charge by charge injection can be more effectively conducted so as to

reliably form a high-quality image. Particularly for application of charge, well writing can be secured.

On page 26, please delete the second full paragraph and replace it with the following new paragraph:

On the other hand, the method of manufacturing the image carrier 2 of this embodiment comprises previously forming the large number of concavities $2b_1$ such that these are dispersed separately from each other, coating the surface of the dielectric layer 2b including these concavities $2b_1$ with the conductive material $2c_1$, and then grinding the coated conductive material $2c_1$. According to this method, the large number of conductive portions $2c_1$ separately dispersed can be easily formed. Therefore, the image carrier 2 can be easily manufactured.

Please delete the paragraph bridging pages 26 and 27 and replace it with the following new paragraph:

In another method of manufacturing the image carrier 2, the conductive portions $2c_1$ are formed by spraying liquid, prepared by dispersing conductive particles in the alkali liquid, onto an insulating binder layer 2d, as the outermost layer of the image carrier 2 which is soluble relative to alkali, at equal intervals defined by the ink jet printing method. Also according to this method, the large number of conductive portions $2c_1$ separately dispersed can be easily formed. Therefore, the image carrier 2 can be easily manufactured.